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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/548,407	09/08/2005	Chiaki Yokoyama	TAN-354	8005
63479 7590 12/10/2008 HAHN & VOIGHT PLLC 1012 14TH STREET, NW SUITE 620 WASHINGTON, DC 20005				
EXAMINER				
WANG, CHUN CHENG				
ART UNIT		PAPER NUMBER		
1796				
MAIL DATE		DELIVERY MODE		
12/10/2008		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/548,407

**Applicant(s)**

YOKOYAMA ET AL.

**Examiner**

Chun-Cheng Wang

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 September 2008.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-5 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1 and 3-5 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-8508)  
Paper No(s)/Mail Date \_\_\_\_\_  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. This office action is in response to the Amendment filed on 09/04/2008. Claims 2 and 6-11 are cancelled. Claims 1 and 3-5 are now pending.
2. The objections and rejections not addressed below are deemed withdrawn.
3. The text of those sections of Title 35, U.S. Code not included in this section can be found in a prior Office Action.

#### *Claim Rejections - 35 USC § 103*

4. Claims 1 and 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boudreau et al. (WO 02/34863 A1).

Boudreau et al. disclose methods for removing mercaptans from hydrocarbons streams. The methods use basic metal salts which react with mercaptans to form mercaptides. The metal salt are dissolved or suspended in ionic liquids. After the mercaptides are absorbed into the ionic liquid, the demercaptanized hydrocarbon stream can be removed, by distillation, decantation or gravity separation. Then the mercaptides can be oxidized to form disulfides which can be readily removed from the ionic liquid (Abstract). The ionic liquid is not soluble in non-polar hydrocarbons (page 5, line 19.)

Boudreau et al. disclose ionic liquids are organic compounds that are liquid at room temperature (page 5, line 17). Boudreau et al. further disclose  $\text{bmim}^+ \text{BF}_4^-$  and  $\text{bmim}^+ \text{PF}_6^-$ , where  $\text{bmim}$  = 1-butyl-3-methylimidazolium, that are liquids at room temperature (page 13, Table 1.)

Boudreau et al. is **silent** on the ratio a/b to be at least 0.05.

It is clear that Boudreau et al. teach all the limitations in claims 1 and 3-5 except that they are silent on the a/b ratio.

The ratio of a/b is the ionic liquid absorption efficiency indicator for each pair of particle/ionic liquid, the higher the number the better the ionic liquid performs, i.e. less amount to remove or extract the particles in the dispersion.

The caselaw has held that “Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955.) Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to achieve the claimed ratio a/b by routine optimization and thereby obtain the present invention.

#### ***Response to Arguments***

5. Applicant's arguments filed 09/04/2008 have been fully considered but they are not persuasive.
6. Applicant's arguments: “Boudreau et al. teaches an amount of mercaptans to be removed from a hydrocarbon stream that depends on a thermodynamically decided value such as solubility. In contrast, the claimed invention relies on a ratio of a water phase to an ionic liquid phase.” (page 9, lines 5-7) and “In other words, the concentration of an aqueous medium relative to an ionic liquid is important.” (page 9, lines 12-13)

Response to argument: the “ratio of a water phase to an ionic liquid phase” and “the concentration of an aqueous medium relative to an ionic liquid” are all related to the particle solubility in the ionic liquid. The ratio  $a/b$  (mMole/mL) is also one of the parameters of particle solubility, i.e. the amount, mMole, of particle the ionic liquid could absorb per mL or the particle concentration gradient between the aqueous medium dispersion and the ionic liquid. Although Boudreau et al. is silent on the ratio  $a/b$ , the reference sufficiently suggest the particle solubility in ionic liquid.

7. Applicant's arguments: “Boudreau *et al.* also teaches away from the claimed invention. The reference teaches forming a solution of a basic metal salt such as sodium hydroxide in an ionic liquid, preferably a non-water reactive ionic liquid, and contacting the ionic liquid solution with a hydrocarbon stream in a manner which contacts mercaptans in the stream with the basic metal salt. Then, the resulting mercaptide salts are selectively dissolved into the ionic liquid phase (or water phase) from an oil phase. Hence, two steps must take place in Boudreau *et al.*: (1) dissolving sodium into the ionic liquid and (2) dissolving mercaptide into the ionic liquid.” (page 10, lines 2-8) and “the ionic liquid of Boudreau et al. alone cannot dissolve mercaptide (the intended target) whereas in the claimed invention, the fine particles can be dissolved by the ionic liquid.” (page 11, lines 3-4)

Response to argument: Boudreau et al. teach all the claimed limitations explicitly or implicitly even it teaches two step process which the application does not exclude. Attention is drawn to Boudreau et al. “The resulting mercaptide salts are either dissolved or dispersed in the ionic liquid, dissolved in the reaction water or precipitated. Preferably they are dissolved in ionic liquid.” (page 7, lines 3-5) The mercaptide salts

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chun-Cheng Wang whose telephone number is (571)270-5459. The examiner can normally be reached on Monday to Friday w/alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1796

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ling-Siu Choi/  
Primary Examiner, Art Unit 1796

Chun-Cheng Wang  
Examiner, Art Unit 1796

/ccw/